REMARKS

This amendment, which is submitted in conjunction with a Request for Continued Examination, is in response to the Office Action dated July 23, 2007 in which claims 8-19 were rejected under 35 U.S.C. § 102(e) as being anticipated by Tabani (U.S. Patent Publication No. 2004/0007255) and claims 8-19 were rejected under 35 U.S.C. § 102(b) as being anticipated by Materna (U.S. Patent No. 6,454,871), Schleiffarth (U.S. Patent No. 6,365,005), Wei (U.S. Patent No. 6,183,708), Gruszczynksi (U.S. Patent No. 5,941,257), Simpson (U.S. Patent No. 5,783,245), and Welch (U.S. Patent No. 5,603,826). With this Amendment, claim 8 has been amended and claims 21-24 have been added. In reliance on the following remarks, the present application with pending claims 8-24 is in condition for allowance, and reconsideration and notice to that effect are respectfully requested.

Rejection of Claims 8-19 under 35 U.S.C. § 102(e)

In the Office Action, independent claim 8 and dependent claims 9-19 were rejected under 35 U.S.C. § 102(e) as being anticipated by Tabani (U.S. Publication No. 2004/0007255). "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

As amended, claim 8 requires a vessel having a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of the vessel at a liquid flow rate of about 2 to about 20 gallons per minute and a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. The delivery head includes a spray diverter positioned with respect to the outlet of the delivery arm to divert the treatment composition flowing from the outlet generally upward and outward to create the target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the treatment composition and to provide a back pressure of less than about 10 psig.

Tabani (U.S. Publication No. 2004/0007255) describes an apparatus and method for cleaning pipelines, tubing and membranes using two-phase flow. Tabani specifically describes the cleaning of interior surfaces and passageways that are long and narrow, such as dental instruments, tubing, filters, piping systems and membranes.

Tabani does not describe a delivery head or a spray diverter that teaches all the elements of claim 8. Tabani describes a nozzle that is used to generate droplets of a predetermined size. *See* [0066] at pages 6 and 7. The Office Action asserts that "nozzle" and "delivery head" are synonymous in that they both contain an opening through which a fluid may flow. However, even if "nozzle" and "delivery head" were synonymous, the nozzle in Tabani does not teach all the limitations of the delivery head of claim 8. First, Tabani does not teach a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of the vessel. Tabani's nozzle is used to "generate liquid droplets in the range between 25 and 400 microns in diameter" (*see* [0066] at page 7); Tabani does not teach a delivery head that delivers a multiple phase composition to a target spray pattern. Additionally, Tabani's examples describe liquid flow rates that range from 0 to 2.0 gallons per minute. *See* Example 10. While Tabani describes liquid flow rates, it does not describe the flow rate limitations of claim 8 (about 2 to about 20 gallons per minute). Tabani's examples also describe ratios of gas to liquid of 1:1 to 30,000:1. However, these gas:liquid ratios are generally described at pressures other than atmospheric pressure. Tabani does not specifically teach the gas:liquid ratio ranges of claim 8 at atmospheric pressure (about 5:1 to about 75,000:1 at atmospheric pressure). Thus, Tabani does not teach the delivery head of claim 8.

Tabani also does not teach the spray diverter element of claim 8. The Office Action asserts that the "droplet impact" described in Tabani at [0034] on page 3 concerns a spray diverter. Tabani, however, describes the "droplet impact at the lumen surface" at [0034]. This lumen surface is not a surface within the delivery head that creates a target spray pattern, but rather the interior surface to be cleaned. *See* [0028] at page 3. Additionally, Tabani does not describe a spray diverter that diverts the multiple phase treatment composition in a generally upward and outward

target spray pattern to the interior surface of a vessel. Furthermore, Tabani's examples describe air pressures of 8 to 80 psig. With the exception of one example (Example 10, Test Series I) that describes an air pressure of 8 to 32 psig, these pressure ranges do not teach the back pressures of claim 8 (less than about 10 psig). While Example 10, Test Series 1 teaches an air pressure as low as 8 psig, it does not teach the other necessary elements of claim 8. For instance, Example 10, Test Series 1 describes liquid flow rates of 0.12 to 1.2 gallons per minute. *See* [0176] at page 16. These liquid flow rates are outside the claimed range of claim 8 noted above (about 2 to about 20 gallons per minute). Example 10, Test Series 1 also does not teach diverting the multiple phase treatment composition in a generally upward and outward target spray pattern. Thus, Tabani does not teach the spray diverter of claim 8.

While Tabani describes examples of cleaning with two-phase flow, it does not describe a delivery head that delivers a multiple phase treatment composition in a generally upward and outward target spray pattern at a liquid flow rate of about 2 to about 20 gallons per minute and a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. Tabani also does not describe a spray diverter positioned with respect to the outlet of the delivery arm to divert the multiple phase treatment composition flowing from the outlet generally upward and outward to create the target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition and to provide a back pressure of less than about 10 psig. Because these limitations of claim 8 are not taught by Tabani, Tabani does not anticipate claim 1.

In that independent claim 8 is in condition for allowance, the rejections to claims 9-19, which depend therefrom, should be withdrawn and claims 8-19 allowed.

Rejection of Claims 8-19 under 35 U.S.C. § 102(b)

In the Office Action, independent claim 8 and dependent claims 9-19 were rejected under 35 U.S.C. § 102(b) as being anticipated by Materna (U.S. Patent No. 6,454,871), Schleiffarth (U.S. Patent No. 6,365,005), Wei (U.S. Patent No. 6,183,708), Gruszczynksi (U.S.

Patent No. 5,941,257), Simpson (U.S. Patent No. 5,783,245), and Welch (U.S. Patent No. 5,603,826).

As noted above, amended claim 8 requires a vessel having a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of the vessel at a liquid flow rate of about 2 to about 20 gallons per minute and a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. The delivery head includes a spray diverter positioned with respect to the outlet of the delivery arm to divert the multiple phase treatment composition flowing from the outlet generally upward and outward to create the target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition and to provide a back pressure of less than about 10 psig.

Materna (U.S. Patent No. 6,454,871) describes a method of cleaning surfaces using a mixed phase cleaning mixture of an aqueous solution and a flow of gas. More specifically, Materna describes a method of cleaning tubing of various lengths and porous membranes. Describing a method of mixed phase cleaning does not teach the features of claim 8, however.

Materna does not describe a delivery head or a spray diverter that teaches all the elements of claim 8. First, Materna describes creating a mixed phase flow along a surface, but does not describe delivering the mixed phase flow by using a delivery head for delivering the mixed phase flow in a spray pattern to the surface of a vessel. According to Materna, the mere flow of the mixed phase "creates shear or impact stresses...sufficient to remove biofilm, debris, and contaminants for their surfaces." *See* col. 4, lines 42-44. Thus, Materna does not teach a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of a vessel. Second, Materna describes liquid flow rates ranging from 0 to 0.74 gallons per minute (2800 mL/min). *See* Example 11. However, these flow rate ranges do not teach the liquid flow rate of about 2 to about 20 gallons per minute as claimed in claim 8. Thus, Materna does not teach the delivery head of claim 8.

Materna also does not teach the spray diverter of claim 8. Materna makes no reference to a spray diverter. Thus, Materna does not teach a delivery head having a spray diverter positioned with respect to the outlet of the delivery arm to divert the multiple phase treatment composition flowing from the outlet generally upward and outward to create the target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition. Materna does describe air supply back pressures from 15 to 80 psig. *See e.g.*, Example 12. Even if Materna taught or suggested a spray diverter, however, it does not teach a spray diverter providing a back pressure of less than about 10 psig. Thus, Materna does not teach the spray diverter of claim 8.

Because the delivery head and spray diverter of claim 8 are not taught by Materna, Materna does not anticipate claim 8.

Schleiffarth (U.S. Patent No. 6,365,005) describes an apparatus and method for vapor compression distillation. As Schleiffarth is primarily concerned with the description of a vapor compression distillation apparatus, Schleiffarth provides few details with respect the clean-in-place aspect of his invention. Thus, Schleiffarth does not teach the structural elements of the delivery head and spray diverter of claim 8.

Schleiffarth does not describe a delivery head or a spray diverter that teaches all the elements of claim 8. Schleiffarth describes full spray nozzles 49 and clean-in-place nozzles 47 (also described as a steam scrubbing nozzle 47). *See* col. 3, lines 60-65; col. 6, lines 56-58; and Fig. 5. These nozzles, however do not satisfy all the elements of the delivery head of claim 8. First, full spray nozzles 49 "spray liquid feed or other suitable liquid (such as process water)." Schleiffarth does not teach that the full spray nozzles deliver a gas or a multiple phase composition. Thus, the full spray nozzles do not deliver a multiple phase treatment composition at a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. Also, according to Fig. 5, the full spray nozzles 49 deliver liquid in a generally downward and outward direction. Thus, the full spray nozzles do not deliver a multiple phase treatment composition in a generally upward

and outward target spray pattern. Schleiffarth does not describe any particular liquid flow rate for the full spray nozzles. Thus, the full spray nozzles do not teach the delivery head of claim 8.

Schleiffarth's description of the clean-in-place nozzles (or steam scrubbing nozzles) 47 also does not satisfy all the elements of the delivery head of claim 8. Schleiffarth does not describe what the clean-in-place nozzles deliver to vapor disengagement section 44. One may presume from the name of the nozzle that a cleaning solution or steam may be delivered, but Schleiffarth provides no definitive disclosure. Therefore, these nozzles do not teach a vessel having a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of the vessel at a liquid flow rate of about 2 to about 20 gallons per minute and a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. Thus, the clean-in-place nozzles do not teach the delivery head of claim 8.

Schleiffarth also does not teach the spray diverter of claim 8. Schleiffarth does not teach or suggest any form of a spray diverter in its disclosure. Schleiffarth does not describe nozzles 47 and 49 or any other elements as having spray diverters for diverting a multiple phase treatment composition generally upward and outward to create a target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition. Schleiffarth also does not teach any particular system pressures with respect to nozzles 47 and 49. Therefore, Schleiffarth does not teach a spray diverter positioned with respect to the outlet of the delivery arm to divert the multiple phase treatment composition flowing from the outlet generally upward and outward to create the target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition and to provide a back pressure of less than about 10 psig. Thus, Schleiffarth does not teach the spray diverter of claim 8.

Because the delivery head and spray diverter of claim 8 are not taught by Schleiffarth, Schleiffarth does not anticipate claim 8.

Wei (U.S. Patent No. 6,183,708) describes a method for using peroxyacid compounds to reduce odors. More specifically, a process for the treatment of plant fluid effluent containing odor compounds is described.

Wei does not describe a delivery head or a spray diverter that teaches all the elements of claim 8. The Office Action asserts that Fig. 2A describes an almost identical delivery system to that of the Applicant's, including a delivery head. *See* Office Action, page 3. Fig. 2A diagrams a solution being sprayed 23 onto an odor laden fluid 21 traveling through a venturi system. This figure may describe a delivery head, but it does not teach the delivery head of claim 8. Fig. 2A shows a spray flowing horizontally onto odor laden fluid traveling vertically. The solution being sprayed is directed towards the odor laden fluid, not an interior surface of a vessel. Thus, Wei does not teach a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of the vessel. Wei describes a process "whereby a finely divided or fogged peroxy acid composition" is sprayed onto odor laden fluid. *See* col. 5, lines 30-31. Wei does not make any mention of gas: liquid ratios, however. Thus, Wei does not teach a delivery head for delivering a multiple phase treatment composition at a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. Therefore, Wei does not teach the delivery head of claim 8.

Wei also does not teach the spray diverter of claim 8. The Office Action asserts that the diverter valve 8'' described in Wei at col. 12, lines 8-9 concerns a spray diverter. This diverter valve, however, merely "recycles a portion of the aqueous flow back to the holding tank 6 while diverting the remainder as waste stream 9." *See* col. 12, lines 10-12. This diverter valve does not divert a multiple phase treatment composition according to Wei. The Office Action also asserts that Fig. 2A describes an almost identical delivery system to that of the Applicant's, including "a means of diverting the flow." *See* Office Action, page 3. Fig. 2A diagrams a solution being sprayed 23 onto an odor laden fluid 21 traveling through a venturi system. This figure may describe a delivery head, but it does not teach a spray diverter positioned with respect to the outlet of the delivery arm to divert a multiple phase treatment composition flowing from the outlet

generally upward and outward to create a target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition. Wei also makes no mention of back pressure, thus it does not teach a spray diverter providing a back pressure of less than about 10 psig. Thus, Wei does not teach the spray diverter of claim 8.

Because the delivery head and spray diverter of claim 8 are not taught by Wei, Wei does not anticipate claim 8.

Gruszczynksi (U.S. Patent No. 5,941,257) describes a method of cleaning a piping system using two-phase flow and optimizing flow rate ratios. More specifically, Gruszczynksi describes the cleaning of pipes that have an inner diameter of one inch or less. Gruszczynksi focuses on the method of optimizing the cleaning of pipes and does not describe structural features of devices or systems used to implement the method of optimization or cleaning. Thus, Gruszczynksi does not describe a delivery head or a spray diverter that teaches all the elements of claim 8.

Gruszczynksi does not teach or suggest a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of a vessel. Gruszczynksi describes slug or plug flow within a pipe where slugs or plugs of water are separated by zones of pressurized gas. *See* col. 4, lines 58-61. Gruszczynksi does not describe delivering a multiple phase composition to a target spray pattern on an interior surface of a vessel, but rather flow through a length of pipe or a piping system.

Gruszczynksi discusses optimizing flow rate ratios but does not disclose all the necessary limitations of claim 8. Gruszczynksi does not teach liquid flow rates of about 2 to about 20 gallons per minute and a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. In multiple figures, Gruszczynksi identifies liquid flow rate data points ranging from 0 to 1000 gallons per minute. However, exact data points are not disclosed and a logarithmic axis is used, making a determination for whether these data points fall within the limitations of claim 8 (about 2 to about 20 gallons per minute) difficult. Examples 1 and 2 describe flow rate ratios of 34.4 to 57.0 gallons per minute. Nevertheless, Gruszczynksi does not teach a

volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. Gruszczynksi notes that "the ratio of gas to liquid at which the optimum flow rate occurs is certainly not apparent." *See* col. 10, lines 18-20. Gruszczynksi defines a process for determining an optimal flow rate ratio by obtaining back pressure information from the piping system and then performing calculations to determine the optimal flow rate. *See* col. 10, lines 4-6. Gruszczynksi, however, does not teach any specific volumetric ratios of gas to liquid. Thus, Gruszczynksi does not teach a vessel having a delivery head for delivering a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of the vessel at a liquid flow rate of about 2 to about 20 gallons per minute and a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure.

Gruszczynksi also does not teach the spray diverter elements of claim 8. Gruszczynksi describes system pressures from 10 to 40 psi. *See* Fig. 1. However, Gruszczynksi does not teach a spray diverter that provides a back pressure of less than about 10 psig. Gruszczynksi does not teach or suggest any form of a spray diverter in its disclosure of methods to optimize two-phase flow. Gruszczynksi also does not teach diverting a multiple phase treatment composition generally upward and outward to create a target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition. Thus, Gruszczynksi does not teach the spray diverter of claim 8.

Because the delivery head and spray diverter of claim 8 are not taught by Gruszczynksi, Gruszczynksi does not anticipate claim 8.

Simpson (U.S. Patent No. 5,783,245) describes a method and apparatus for recovering dairy product from a milk storage tank.

Simpson does not describe a delivery head or a spray diverter that teaches all the elements of claim 8. Simpson describes a storage tank with a spray system "of general type that is normally adapted to apply a cleaning spray solution to the inner walls of the storage tank." *See* col. 3, lines 37-39. The spray system is adapted to provide a "burst" of treatment fluid. *See* col. 3, line 40. However, Simpson does not teach or suggest that the spray system it describes is suitably

adapted to deliver a multiple phase treatment composition, whether by burst or any other means. Because Simpson does not teach or suggest delivery of a multiple phase treatment composition comprising a liquid and a gas, it does not teach a volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. For the same reason, Simpson also does not teach a delivery head that delivers a multiple phase treatment composition liquid flow rate of about 2 to about 20 gallons per minute. Thus, Simpson does not teach the delivery head of claim 8.

Simpson also does not teach the spray diverter of claim 8. Several times, Simpson describes selected or desired pressures with regards to fluid flow. *See e.g.*, col. 2, line 63. However, these selected or desired pressures are not disclosed and the references refer to fluid flowing to a filtration apparatus and not to fluid being diverted from a spray diverter to a target spray pattern on an interior surface to be cleaned. Thus, Simpson does not teach or suggest a spray diverter positioned with respect to the outlet of the delivery arm to divert the multiple phase treatment composition flowing from the outlet generally upward and outward to create the target spray pattern and an open area positioned with respect to the spray diverter to allow passage of the multiple phase treatment composition and to provide a back pressure of less than about 10 psig.

Because the delivery head and spray diverter of claim 8 are not taught by Simpson, Simpson does not anticipate claim 8.

Welch (U.S. Patent No. 5,603,826) describes self-cleaning return pump systems for use with clean-in-place systems for cleaning vessels.

Welch does not describe a delivery head or a spray diverter that teaches all the elements of claim 8. Welch describes a spray ball (*see* B, Fig. 2), but this spray ball does not deliver a multiple phase treatment composition. It delivers only liquid solutions for rinsing and washing. *See* col. 7, lines 47-48. The top discharge port 36 of the return pump system 10 described in Welch may deliver a multiple phase composition, but it does not describe a delivery head that teaches all the necessary elements of claim 8. According to Welch, the flow rate through the return pump system is in a range of about 200 to about 300 gallons per minute. *See* col. 7, lines 9-11. This rate is significantly higher and well outside the range limitations of claim 8 (about 2 to about 20

gallons per minute). Welch also does not teach the claimed volumetric ratio of gas to liquid of between about 5:1 and 75,000:1 at atmospheric pressure. Furthermore, Welch does not teach that its top discharge port delivers a multiple phase treatment composition in a generally upward and outward target spray pattern to the interior surface of a vessel. Thus, Welch does not teach the delivery head of claim 8.

Welch also does not teach the spray diverter of claim 8. Welch describes a spray ball, but the disclosure does not teach or suggest that the spray ball includes a spray diverter capable of delivering or diverting a multiple phase treatment composition. Furthermore, Welch also makes no mention of back pressure, thus Welch does not teach a spray diverter that provides a back pressure of less than about 10 psig. Thus, Welch does not teach or suggest the spray diverter of claim 8.

Because the delivery head and spray diverter of claim 8 are not taught by Welch, Welch does not anticipate claim 8.

In that independent claim 8 is in condition for allowance, the rejections to claims 9-19, which depend therefrom, should be withdrawn and claims 8-19 allowed.

Claims 21-24 have been added. Claims 21-24 are supported and enabled by the specification. Support for the new claims may be found in paragraphs [0006], [0007], [0027], [0031]-[0033], and [0035]-[0038] of the published application. No new matter has been added with the introduction of these new claims.

The Commissioner is authorized to charge any additional fees associated with this paper or credit any overpayment to Deposit Account No. 11-0982.

Respectfully submitted,
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